



2. TECHNICAL
ABSTRACTS

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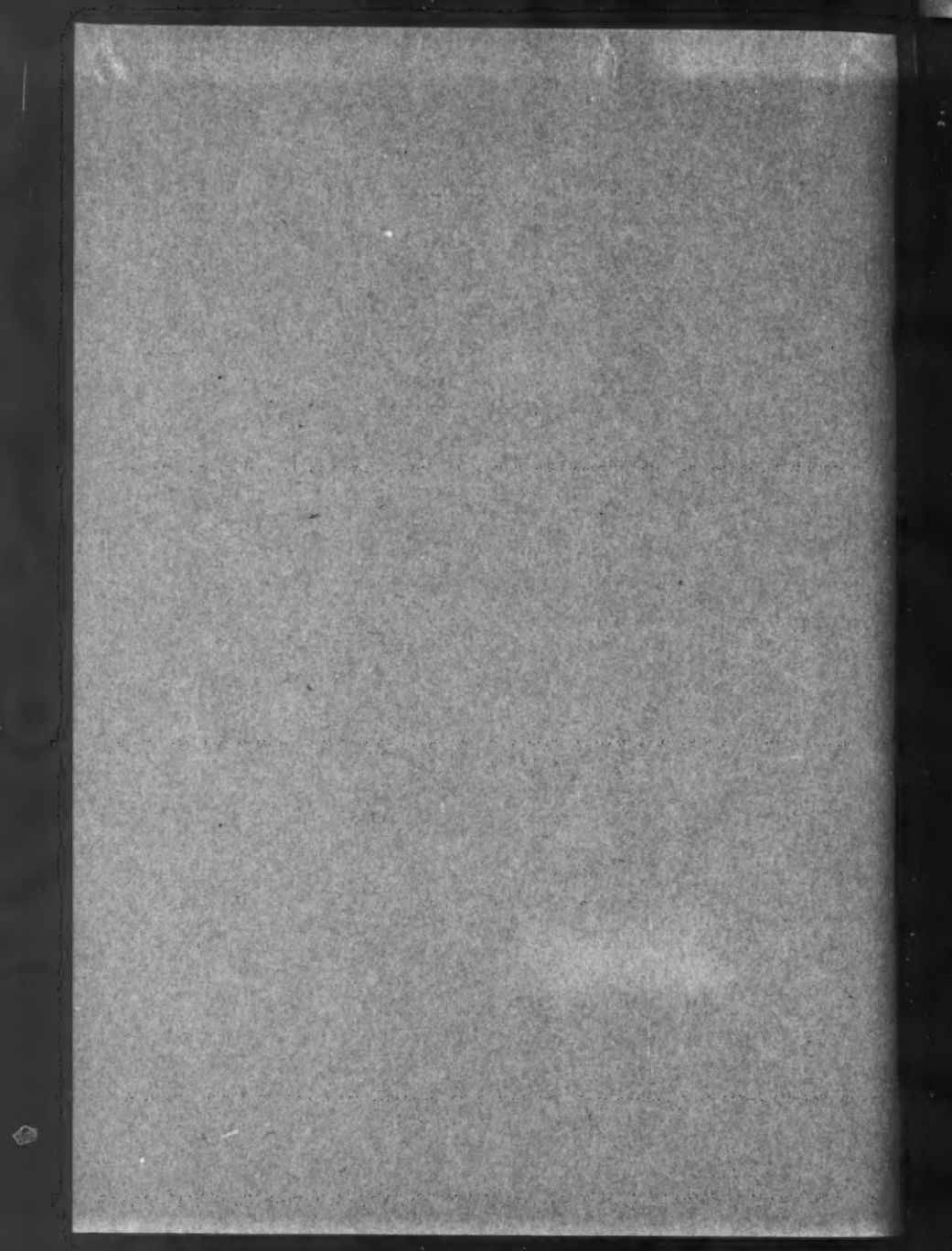
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1. LEAD DEVELOPMENT ASSOCIATION

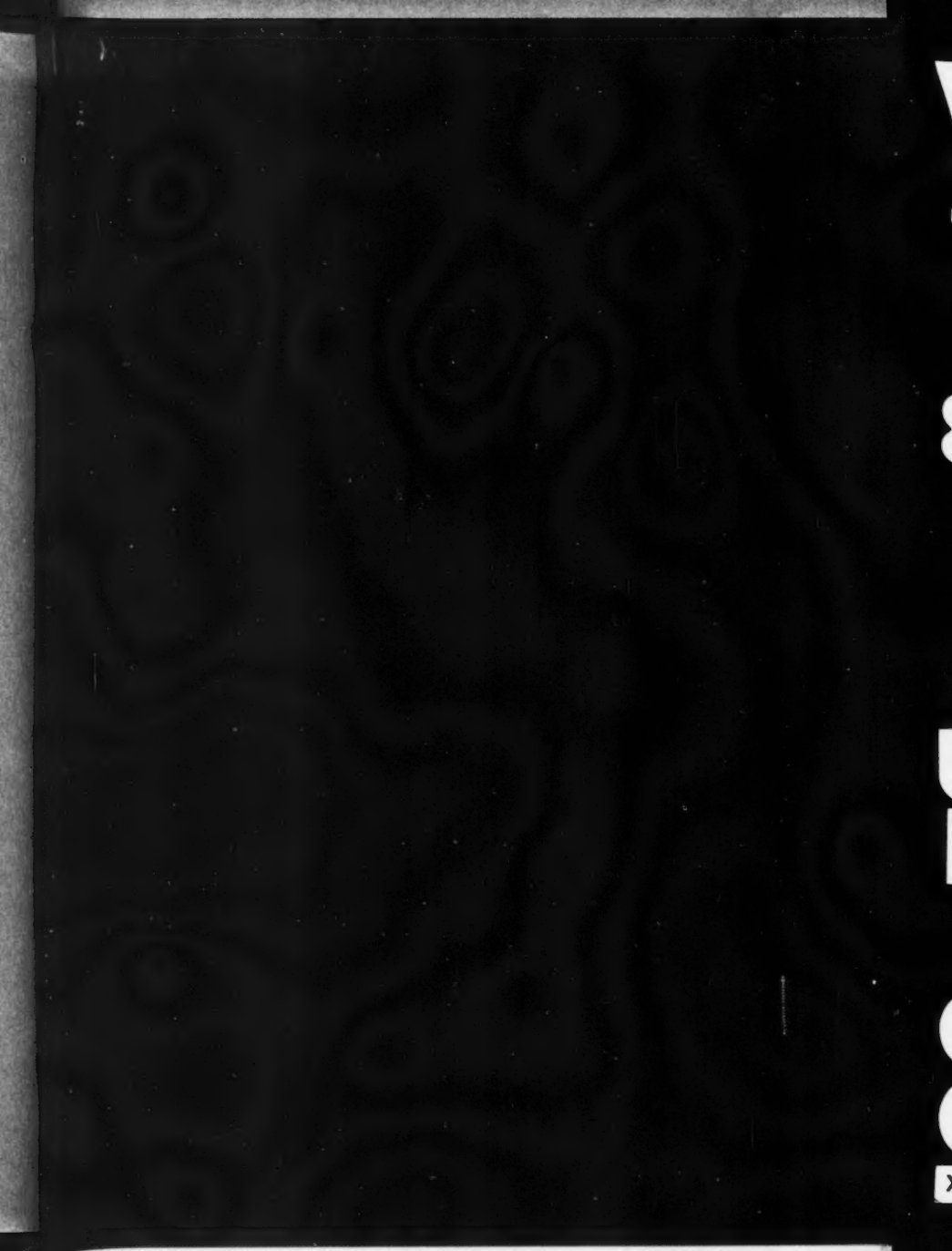
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LEAD ABSTRACTS

**A Selection of Abstracts of Literature and Patents
on the Utilisation of Lead, its Alloys and Compounds**

No. 8 JULY 1960

Technical Papers 409 to 446

Patents 447 to 469

ISSUED BY

LEAD DEVELOPMENT ASSOCIATION

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C O N T E N T S

PART I

Technical Papers

Page 3

PART II

Patents

Page 11

In the event of books, documents, articles and patents, quoted in Technical Abstracts, being unobtainable from or through local libraries, technical booksellers (many of whom provide an international service) or appropriate government departments, applicants should notify their difficulties to the Association, which will do its best to assist.

PART I

TECHNICAL PAPERS

	Page
ALLOYS	4
ANALYSIS	4
ATOMICS	4
BATTERIES	4
BEARINGS	5
COATINGS	5
CORROSION	5
ELECTROCHEMISTRY	6
EXTRUSION	7
LEAD — GENERAL	7
METALLOGRAPHY	7
METALLURGY	7
PAINTS	8
PHYSICAL PROPERTIES	8
POWDER METALLURGY	8
REFINING	9
SINTERING	9
SMELTING	10
SOLDERS	10
STATISTICS	10

ALLOYS

409 A NEW CLASS OF LEAD-BASE ALLOYS (LEAD-CEMENTED ALLOYS)

*D. N. Williams,
J. A. Houck and
R. I. Jaffee*

Met. Progress, Feb., 1960, 77(2), 79-81.

Various metal powders are introduced into molten lead, the alloys being cast and extruded. Up to 30% by volume of nickel, copper, tungsten, iron or cobalt have been used. While tensile properties are improved the corrosion resistance is generally reduced.

ANALYSIS

410 ANALYSIS OF LOW-MELTING Bi-Pb-Cd-Sn ALLOYS

*R. Pribil and
M. Kopanica*

Chemist-Analyst, Dec., 1959, 48(4), 87, 88-90.

Two quantitative procedures are given for the analysis of various low melting point alloys of lead-bismuth-cadmium-tin. Several binary and ternary alloys are considered. The procedures involve EDTA titrations with ortho-phenanthroline as masking agent and xylenol orange as indicator.

411 A FIELD METHOD FOR DETERMINING TOTAL AIR-BORNE LEAD

*B. E. Dixon and
P. Metson*

Analyst, Feb., 1960, 85, 122-126.

ATOMICS

412 LEAD-LITHIUM SHIELDING ALLOY: METALLURGICAL STUDIES

*D. H. Janßen,
E. E. Hoffman and
D. M. Shephard*

J. Nuclear Materials, Oct., 1959, 1(3), 249-258.

General properties of lead-lithium alloys. Hardness, tensile, creep and corrosion properties are considered. Descriptions are given of alloying and casting procedures for the 0.69% lithium alloy and of the fabrication of shielding slabs.

BATTERIES

413 WET-CELL BATTERIES FOR POWER

P. L. Howard

Product Engineering, Vol. 31, No. 7, page 75, Feb. 15, 1960.

Compares performance characteristics of lead-acid and other accumulators.

414 THE MOTIVE POWER STORAGE BATTERY

Material Handling Engineering, Vol. 15, page 60, Feb., 1960.

Three short articles on purchase, maintenance and charging of batteries.

BEARINGS

- 415 PROPERTIES OF BEARING MATERIALS AT 20-125°C.** *E. E. Verner and N. S. Zinovich*

Metallovedenie i Termicheskaya Obrabotka Metallov, March, 1959, No. 3, 56-59.

(In Russian.) Hardness and compressive properties of various bearing alloys, both lead and tin based, are measured at various temperatures.

COATINGS

- 416 METAL SPRAYING** *H. Reininger*

Metall, Feb., 1960, 14(2), 115-125.

(In German.) A general survey covers hand and mechanised spraying, pre-treatment of surfaces, structure and properties of coatings, spray soldering and welding, and sprayed bearings. Describes apparatus and testing of sprayed coatings.

- 417 LOW COST COATINGS FOR METAL PRODUCTS** *R. J. Fabian*

Materials in Design Engineering, March, 1960, 51(3), 123-138.

Hot dipped lead, zinc and tin coatings are among those discussed. Includes tables showing the relative costs of various coatings and the suitable applications.

CORROSION

- 418 CORROSION RESISTANCE PROPERTIES OF LEAD** *H. C. Wesson*

Corrosion Engineer, Dec., 1959, 1(9), ii-v, in *Corrosion Prevention and Control*, Dec., 1959, 6(12).

Publication of a lecture on properties of lead and alloys, specifications, analysis and corrosion resistance.

- 419 METALLURGICAL EXAMINATION OF A FAILED ELECTROMAGNETIC LIQUID METAL (LEAD-BISMUTH) PUMP CHANNEL** *G. H. Broomfield*

Metallurgia, Nov., 1959, 60, 201-203.

Examination of a 13% chromium-steel pump channel in which molten lead-bismuth alloy had been circulated. Liquid metal corrosion had some effect in causing failure due to fatigue.

420 INTERNAL CATHODIC PROTECTION.

5.—FURTHER PROBLEMS INVOLVING CLOSED RECTANGULAR BOXES: THE USE OF LINE ANODES

*C. Plumpton and
C. Wilson*

Corrosion Prevention and Control, Dec., 1959, 6(12), 34-40.

Discusses lead alloy and other anodes. Analyses the current flow due to line anodes and shows that total current required to protect any specified box can be calculated. Suggests theoretical anode designs and combinations of line and point anodes.

421 THE SYSTEMATICS OF CORROSION OF METALS IN SOIL. 2.—LEAD. 3.—COPPER AND COPPER ALLOYS

(2) *T. Markovic,
M. Sevdic and
N. Parkivoc*
(3) *T. Markovic,
M. Sevdic and
L. Rubinic*

Werkstoffe u. Korrosion, Jan., Feb., 1960, 11(1, 2), 22-27, 87-93.

(In German.) Corrosion of metals in soil is said to be electrolytic and to be determined by the water content and the pH value of the soil. Corrosion/pH diagrams are plotted from published data on corrosion of lead. 1% antimonial lead, copper and copper alloys and the curves are discussed.

ELECTROCHEMISTRY

422 ANODIC PASSIVATION AND DEPASSIVATION OF LEAD IN SULPHURIC ACID

W. Feitknecht

RAE Translation 841 from Z. Elektrochem., 1958, (62(6/7), 795-803.

Electron microscopic investigation of anodic passivation of lead. Reactions are compared to those taking place in lead-acid accumulators. Self-discharge on lead electrodes determined.

423 THE POLYMORPHISM OF LEAD DIOXIDE AND THE STRUCTURE OF ITS ELECTROLYTIC DEPOSITS

*I. I. Astakhov,
I. G. Kiseleva and
B. N. Kabanov*

RAE Translation 847 from Koklady Akad. Nauk SSSR, 1959, 126(5), 1041-1043.

Electron microscopic study of alpha and beta PbO₂ electrodeposits from sulphuric acid solutions. Describes differences in various properties.

EXTRUSION

- 424 THE HOT EXTRUSION OF NON-FERROUS METALS** *R. Chadwick*

Metallurgical Reviews, 1959, 4(15), 189-255.

A monograph dealing with extrusion methods, details of flow in direct extrusion and surfaces of extruded products. Discusses lead and its alloys and other materials.

LEAD — GENERAL

- 425 PLANNING FOR GROWTH: MOUNT ISA MINES LTD.** *G. R. Fisher*

Australian Institute of Management, National Management Conference, Brisbane, 1959, preprint, 15 pp.

Describes lead, silver, zinc and copper production, and a recently completed electrolytic refinery. Describes the economic and technical difficulties overcome in the establishment of this organisation.

METALLOGRAPHY

- 426 THE NON-DESTRUCTIVE METALLOGRAPHY OF TIN AND ITS ALLOYS** *P. A. Jacquet*

Metallurgia, Feb., 1960, 61, 93-97.

Application of the Ellopol electrolytic swab polishing technique to tin, lead and tin-lead alloys. A water-free electrolyte ("Perac") was used.

METALLURGY

- 427 EFFECT OF SOLUTE IMPURITIES (Sn and Ag) ON PREFERRED ORIENTATION IN ANNEALED HIGH-PURITY LEAD** *K. T. Aust and J. W. Rutter*

Trans. AIME Met. Soc., Feb., 1960, 218(1), 50-54.

- 428 BOUNDARY MIGRATION OF HIGH-PURITY LEAD DURING CREEP AND GRAIN GROWTH** *R. C. Gifkins*

Trans. AIME, Dec., 1959, 215(6), 1015-1022.

- 429 THE LEAD-CALCIUM SYSTEM**

*V. N. Vigdorovich
and
A. Ya Nashel'skii*

Russian Journal of Inorganic Chemistry, Vol. 4, No. 9, page 922, Sept., 1959.

A new version of the lead-calcium phase diagram is given. Micro-hardness has been used to determine the solubility of calcium in lead.

- 430 DISTRIBUTION OF SILVER BETWEEN LIQUID LEAD AND ZINC** *D. T. Peterson and R. Kontrimas*

The Journal of Physical Chemistry, Vol. 64, No. 3, page 362, March, 1960.

Determination of distribution coefficient of silver between lead and zinc over a wide concentration range at three temperatures. Change in concentration does not affect the coefficient.

PAINTS

- 431 METALLIC LEAD AS A PIGMENT FOR ANTI-CORROSION PAINTS** *J. A. Calcutt*

Corrosion Prevention and Control, Nov., 1959, 6(11), 34-38.

Describes the mechanism by which metallic lead pigments protect steel. Demonstrates superiority of metallic lead pigments and lists some applications.

PHYSICAL PROPERTIES

- 432 VISCOSITY BEHAVIOUR OF MOLTEN LEAD ALLOYS IN THE CONCENTRATION RANGE OF SOLID SOLUBILITY** *W. Patterson, H. Brand and H. Trassl*

Giesserei Technisch-Wissenschaftliche Beihefte, Jan., 1960, No. 27, pp. 1477-1481. (In German.) The determination of viscosity of molten binary alloys of lead with various other metals up to the solid solubility limit of the added elements. A relationship is found between the increase of viscosity with small additions and the maximum solid solubility.

- 433 LIQUID-METAL HEAT TRANSFER MEDIA** *S. S. Kutateladze and others*

Book (Translation from Supplement No. 2 to Atomnaya Energiya, 1958), 1959, 149 pp. Consultants Bureau Inc., N.Y.; Chapman & Hall Ltd., London. £9.

Compilation of data obtained in Russia or published abroad. Covers fluid dynamics, heat transfer, heat exchange equipment, corrosion and instrumentation.

POWDER METALLURGY

- 434 TRY HOT EXPLOSIVE-COMPACTING FOR SINTERED POWDER PRODUCTS** *A. Cross*

Iron Age, Dec. 24, 1959, 184(26), 48-50.

Describes techniques for, and advantages of, compacting metal powders above their recrystallisation temperatures. Odd shapes can be formed to conform closely to die dimensions without sintering. Results with lead powders described. Discusses effect of explosion pressure, particle size and oxide films on strength of product.

REFINING

435 INVESTIGATIONS ON THE DECOPPERING OF LEAD IN THE PRESENCE OF TIN, ARSENIC AND ANTIMONY. PART 3

*H. Hartmann,
F. Ensslin and
W. Davidson*

Erzmetall, Feb., 1960, 13(2), 53-58.

(In German.) Earlier parts dealt with first sulphur treatment removing insoluble copper. Part 3 describes second treatment with sulphur. Decoppering only achieved when tin is present. Decoppering is said to be due to the formation of a compound aCu_3bSnSx .

436 SULPHAMIC ACID IN LEAD REFINING

Chem. Trade Journal and Chem. Eng., Vol. 145, No. 3786, page 1253, Dec. 25, 1959.

Brief description of the electrolytic refining plant at the San Gavino, Monreale Smelter in Sardinia.

437 PRODUCTION OF HIGH PURITY LEAD BY AMINE LEACHING

F. A. Forward et al

Preprint of International Mineral Processing Congress, London, England, April, 1960.

Acid pressure oxidation of sulphide ores, leaching with alkaline amines followed by carbonation precipitates basic lead carbonate. This is reduced to produce Ag free lead of 99.99+% purity.

SINTERING

438 THE ROLE OF PILOT PLANT INVESTIGATION IN THE DEVELOPMENT OF UP-DRAUGHT SINTERING OF BROKEN HILL LEAD CONCENTRATE

D. H. Hart

NML Technical J. (India), Feb., 1960, 2(1), 52-59.

Paper presented at Symposium on Pilot Plants in Metallurgical Research and Development, Jamshedpur, Feb., 1960.

439 UP-DRAUGHT ZINC-LEAD SINTERING

R. M. Sellwood

The Mining Journal, Vol. 254, No. 6504, page 434, April 15, 1960.

New problems arising from the technique of re-circulating weak gases included the handling of gases at high temperatures and higher pressure drops across the sinter bed than had been envisaged.

SMELTING

- 440 THE ABSORPTION OF ZINC VAPOUR IN MOLTEN LEAD** *N. A. Warner*

Chemical Engineering Science, Vol. 11, page 161, Nov., 1959.

The scrubbing of gases containing zinc vapour in the recently developed zinc blast furnace is considered to be absorption rather than condensation. A fundamental equation is derived for analysing absorption in terms of conventional gas absorption theories.

- 441 THERMODYNAMIC PROPERTIES OF THE SYSTEM Pb-S-O TO 1100°K.** *H. H. Kellogg and S. K. Basu*

Trans. AIME Met. Soc., Feb., 1960, 218(1), 70-81.

Some of the gaps in the information available on this system are filled and further light is thrown on the lead smelting processes.

SOLDERS

- 442 SOLDERING MANUAL** *American Welding Society*

Book, 1959, 170 pp. AWS, 33 West 39th Street, New York 18. \$5.

Contains chapters on principles, solders, fluxes, joint design, precleaning and surface preparation, equipment, printed circuits and various metals including lead.

- 443 WHICH SOFT SOLDER FOR NUCLEAR SERVICE?** *A. B. Kaufman*

Materials in Design Engineering, Feb., 1960, 51(2), 87-90.

Discussion of factors leading to the choice of a 97.5% lead, 1.5% silver, 1% tin solder as the optimum. 95% tin/5% antimony has better tensile strength but is inferior for low temperature impact tests.

STATISTICS

- 444 LEAD PRODUCTION AND STOCKS IN O.E.E.C. COUNTRIES, JANUARY 1960** *O.E.E.C. Information Division*

Typescript, March 5, 1960, 4 pp. O.E.E.C., 2 rue Andre-Pascal, Paris 16e.

Monthly statistical statement. Now includes a total figure for stocks of refined pig lead.

- 445 AVERAGE PRICES OF COPPER, LEAD, ZINC AND TIN IN LONDON EACH MONTH DURING THE LAST 20 YEARS (1940-1959)** *Vivian, Younger & Bond Ltd.*

Chart, 1960. Obtainable from Vivian, Younger & Bond Ltd., Princes House, 95 Gresham Street, London, E.C.2.

Gives highest and lowest daily prices of each metal for each year on a clearly plotted chart.

- 446 STATISTICAL SUMMARY OF THE MINERAL INDUSTRY** *Overseas Geological Surveys*

Book, 1960. H.M. Stationery Office, £1 7s. 6d.

Covers world production, exports and imports for 1953-58. Production exports and imports of lead are detailed under countries and uses.

PART II

PATENTS

	Page
BATTERIES	12
BEARINGS	13
COATINGS	13
COMPOUNDS	13
ELECTROCHEMISTRY	13
ELECTRONICS	14
GLASS	14
LEADED STEEL	14
LEAD TETRAETHYL	14
METALLURGY	15
REFINING	15
SCRAP	15
SMELTING	16

BATTERIES

447 GERMAN PATENT 1,079,706. "THE ADDITION OF LIGNUM DERIVATIVES TO NEGATIVE PASTES"

ACCUMULATORENFABRIK SONNENSCHNEIN GmbH et al.

Lignin sulphonic acids and sulphonates have long been used with incomplete success for this purpose. The new proposal is to use condensates from lignin sulphonic acids having ion exchange properties. In the example quoted the material is freed from calcium compounds and condensed with formaldehyde, with the later addition of urea. It is claimed that the addition of this complex gives rise to better capacity and voltage stability, and good starting currents particularly in cold conditions.

448 BRITISH PATENT 833,047. "COMPOSITE SEPARATORS"

SVENSKA ACKUMULATOR A. B. JUNGER

The separators are made of two sheets of different materials pressed together. The first is a conventionally porous or semi-permeable material and the second a layer of plastic, the latter being mounted next to the positive electrodes. The plastic material is finally perforated by thin needles, or the like, which not only puncture the material but form burrs at the perforations.

449 GERMAN PATENT 1,079,141. "PHOSPHORIC ACID AND HIGH POROSITY ACTIVE MATERIAL"

ACCUMULATOREN-FABRIK A.G.

The material of positive tubular plates of these batteries has a porosity of 65% to 75% and the sheathing is a micro-porous material such as a glass fibre mat. The electrolyte after charging contains 3-10 grammes per litre of phosphoric acid. The high porosity and small contact surface with the sheathing reduces the loss of capacity expected from the addition of phosphoric acid. On the other hand there is a considerable reduction in corrosion.

450 BRITISH PATENT 832,569. "TUBULAR PLATES"

CHLORIDE BATTERIES LTD.

The tubes containing the active pastes consist of an outer tube of woven or knitted oxidation-resisting yarn fitted inside with a thin glass fibre tube. Both are coated with resin in a manner not to block the interstices of either and are fused together by curing with heat.

451 SOUTH AFRICAN PATENT 59/1042. "BATTERY COMPONENTS"

NATIONAL LEAD CO.

The subject of this patent is an envelope which encloses the battery grid. It is made of fibres of cellulose, partly sheathed with a polymer of an olefinic hydrocarbon, and the fibres are joined together by partial fusion of these sheaths.

452 BRITISH PATENT 817,196. "BATTERY LUGS AND BRIDGES"

VARLEY DRY ACCUMULATORS LTD.

The use of an epoxy resin in which the lugs and bridges are embedded; the use of copper for bridges; a method of assembling the battery through the bottom, later filled with resin; and an electrode (terminal) projecting through the bottom filling material.

BEARINGS

453 BRITISH PATENT 833,024. "BONDING COPPER LEAD BEARING TO AN ALUMINIUM BACKING"

BORG WARNER CORPORATION

The aluminium housing is first given a copper flash followed by a layer of copper-tin-alloy, after which a layer of silver-tin-lead alloy is applied both to this unit and to the copper-lead bearing shell. The latter two are then joined, by fusing the alloy layers.

454 BRITISH PATENT 824,940. "BEARING MATERIALS"

GLACIER METAL CO. LTD.

Porous metal matrix impregnated with PTFE, in or on which is dispersed lead, indium, thallium and/or cadmium.

COATINGS

455 BRITISH PATENT 820,276. "COATED GLASS FIBRES"

B. F. GOODRICH CO.

Alloys of lead containing several minor constituents are claimed to wet the surface of low-soda-ash glass in hot dip coating. Lubrication of fibres by the coating reduces fragility and facilitates spinning into yarn.

COMPOUNDS

456 BRITISH PATENT 819,275. "LEAD DIOXIDE FROM LEAD SULPHATE"

OLIN MATHIESON CHEMICAL CORPORATION

Lead dioxide can be made from an aqueous suspension of lead sulphate in the presence of an alkali metal carbonate by blowing in chlorine at a pH greater than 7.

ELECTROCHEMISTRY

457 BRITISH PATENT 822,979. "ELECTRODEPOSITION OF METALS"

GEIGY CO. LTD.

Electrodeposition from baths containing hydroxycyclohexylethylenediamine triacetic acid as sole complexing agent. Deposition of lead and other metals is described.

ELECTRONICS

- 458 GERMAN PATENT 1,077,877. "LEAD-SELENIUM THERMOELEMENTS"**
MINNESOTA MINING & MANUFACTURING CO.

A previous patent has described an element containing a lead-selenium-tellurium component. In this patent the selenium is replaced by a mixture of sulphur and selenium and the relevant properties of the alloys are enhanced.

GLASS

- 459 GERMAN PATENT 1,078,293. "LEAD GLASS"**
GENERAL ELECTRIC CO. LTD.

This glass of complex composition, containing 0-7% lead oxide, is proposed as suitable for direct sealing to metallic alloys.

LEADED STEELS

- 460 GERMAN PATENT 1,075,320. "THE INJECTION OF SOLIDS INTO MOLTEN METAL"**
ARBED S.A.

The powdered or granular solid is carried in a gas stream and injected into the molten metal in a fine, regular jet which does not diffuse as it impinges on the metal surface, but penetrates deeply beneath. The conditions at the jet nozzle must obey the formula—

$$\frac{D}{d} = 1 + K + \frac{L}{C}$$

where D is the diameter of the nozzle entry section of length L and d is the diameter of the neck section of length C and K is a constant greater than 2.

- 461 AUSTRALIAN PATENT 50040/59. "ADDING LEAD TO STEEL"**
INLAND STEEL CO.

This is alike in all respects to Belgian Patent 579,958 reported in the name of this Company in Technical Abstracts No. 7 (402).

LEAD TETRAETHYL

- 462 BRITISH PATENT 824,848. "LEAD TETRAETHYL"**
ETHYL CORPORATION

Alternative methods of making lead tetraethyl, such as reacting lead oxide or sulphide with a suitable organo metallic compound.

463 BRITISH PATENT 824,849. "LEAD TETRAETHYL"

ETHYL CORPORATION

Methods of making lead tetra-alkyl compounds by reacting a lead organo acid salt and an alkyl metal compound of formula R_nMX_b , R being an alkyl group, M a metal with an electropotential greater than 0.70V and X hydrogen, or a halogen.

464 BRITISH PATENT 827,621. "LEAD TETRAETHYL"

COMP. ITALIANA PETROLIO Sp.A.

Use of an organic ester of phosphorous oxyacid as a catalyst in the conventional reaction between lead sodium alloy and ethyl chloride.

METALLURGY

465 GERMAN PATENT 1,075,840. "PRODUCTION OF LEAD FLAKES"

VERNIS VALENTINE CO.

A solution of a lead salt is electrolysed between a cathode to which lead does not adhere and an anode, made of lead to which 0.1/0.2% of Group IV and Group V elements, has been added.

REFINING

466 SOUTH AFRICAN PATENT 3608/58. "SEPARATION OF LEAD AND ZINC"

METALLURGICAL PROCESSES LTD.

Pure zinc may be obtained from impure zinc containing a little lead by distilling in vacuum at temperatures not appreciably higher than 450° C.

467 INDIAN PATENT 65545. "SEPARATION OF LEAD AND ZINC"

METALLURGICAL PROCESSES LTD.

Zinc vapour, contaminated with lead, is condensed in a circulating stream of molten zinc maintained at a slightly lower temperature. Simultaneously, pure zinc vapour is evaporated from this liquid and separately condensed.

SCRAP

468 INDIAN PATENT 65588. "RECOVERY OF NON-FERROUS METALS, SUCH AS LEAD"

K. PARANJAPPE

The residue is crushed, powdered and subjected to air and water flotation, whereupon the metallic portion separates. The latter is again treated to separate the individual oxides and the metal is subsequently recovered from these oxides.

SMELTING

469 SOUTH AFRICAN PATENT 59/4690. "PRODUCTION OF LEAD"

SHERRITT GORDON MINES LTD.

The ore, after treatment, may contain lead sulphate, lead chloride, lead nitrate or lead oxide. It is leached with an aqueous solution of alkylene and alkanol amines, their acid salts or derivatives, whereupon the lead compounds dissolve and can be thus physically separated from the remainder of the ore.



